WHAT IS CLAIMED IS:

1.   A method for determining the amount of charge which can still be drawn from an energy storage battery comprising:

measuring current values and voltage values at at least two times in a voltage response of the energy storage battery to at least one current pulse, with one voltage/current value pair being obtained for each of the at least two times;

calculating a resistance difference characteristic variable utilizing the measured voltage/current value pairs; and

determining of the amount of charge which can still be drawn from the energy storage battery utilizing the resistance difference characteristic variable.

2.   The method of Claim 1 wherein at least one of the times occurs in a phase whose voltage is not characterized by polarization, and at least one of the times occurs in a phase whose voltage is characterized by polarization.

3.   The method of Claim 1 wherein a first time is chosen before a current pulse with a front current pulse flank, and a second time is chosen after the front current pulse flank of the current pulse.

4.   The method of Claim 1 wherein the step of calculating the resistance difference characteristic variable includes:

calculating current differences between two current values and voltage differences between two voltage values for a plurality of current pulses;

6   calculating a set of difference quotients, wherein each

7   difference quotient is the quotient of a voltage difference and its

8   associated current difference; and

9   calculating the resistance difference characteristic

10   variable from the set of difference quotients.

1   5.   The method of Claim 4 wherein calculating the

2   resistance difference characteristic variable comprises calculating a mean

3   value of the set of difference quotients.

1   6.   The method of Claim 5 wherein the mean value is

2   calculated utilizing linear averaging.

1   7.   The method of Claim 5 wherein the resistance

2   difference characteristic variable is determined only from those

3   voltage/current value pairs which are measured for comparable states of

4   charge or comparable temperatures of the energy storage battery.

1   8.   The method of Claim 1 further comprising determining

2   a change in capacity of the energy storage battery from at least one of

3   the resistance difference characteristic variable and a change of the

4   resistance difference characteristic variable.

1   9.   The method of Claim 1 further comprising determining

2   the amount of charge which can still be drawn from the energy storage

3   battery by means of at least one of a predetermined function and a stored

4   value table for definition of the relationship between amounts of charge

5   and resistance difference characteristic variables.

1   10.   The method of Claim 4 further comprising measuring

2   the temperature of the energy storage battery and determining the

3   amount of charge which can still be drawn from the energy storage

4   battery as a function of the temperature.

1   11.   The method of Claim 10 further comprising

2   normalizing the difference quotients with respect to a basic temperature.

1   12.   The method of Claim 1 further comprising determining

2   the present degree of discharge of the energy storage battery and

3   determining the amount of charge which can still be drawn from the

4   energy storage battery as a function of the degree of discharge.

1   13.   The method of Claim 1 further comprising applying at

2   least one current pulse in one current direction to the energy storage

3   battery.

1   14.   The method of Claim 1 further comprising applying a

2   sequence of current pulses to the energy storage battery, with the current

3   direction of the current pulses changing alternately.

1   15.   The method of Claim 1 wherein the magnitude of the

2   current values is less than a 10-hour current of the energy storage

3   battery.

1   16.   The method of Claim 15 wherein the magnitude of the

2   current values is less than a 50-hour current of the energy storage

3   battery.

1   17.   The method of Claim 15 wherein the magnitude of the

2   current values is less than a 200-hour current of the energy storage

3   battery.

1   18.   The method of Claim 1 wherein a current change

2   takes place between two measurements of two voltage/current value

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3   pairs, with the magnitude of the current change being greater than a

4   5000-hour value of the current of the energy storage battery.

1   19.   The method of Claim 18 wherein the magnitude of the

2   current change is greater than a 1000-hour value of the current of the

3   energy storage battery.

1   20.   The method of Claim 18 wherein the magnitude of the

2   current change is greater than a 200-hour value of the current of the

3   energy storage battery.

1   21.   The method of Claim 18 wherein the current change

2   takes place at a current rate of change whose magnitude is greater than

3   the 5000-hour current of the energy storage battery per second.

1   22.   The method of Claim 19 wherein the current rate of

2   change is greater than the 1000-hour current per second.

1   23.   The method of Claim 20 wherein the current rate of

2   change is greater than the 200-hour current per second.

1   24.   The method of Claim 1 wherein the resistance

2   difference characteristic variable is determined only from those

3   voltage/current value pairs whose first current voltage/current value pair

4   at a first time was measured at most 10 seconds before a current change.

1   25.   The method of Claim 1 wherein the resistance

2   difference characteristic variable is determined only from those

3   voltage/current value pairs whose first current voltage/current value pair

4   at a first time was measured at most 1 second before a current change.

1   26.   The method of Claim 1 wherein the resistance

2   difference characteristic variable is determined only from those

3   voltage/current value pairs whose first current voltage/current value pair

4   at a first time was measured at most 0.1 second before a current change.

1   27.   The method of Claim 1 wherein the resistance

2   difference characteristic variable is determined only from those

3   voltage/current value pairs whose second current voltage/current value

4   pair at a second time was measured at the earliest 0.1 second after the

5   current change.

1   28.   The method of Claim 1 wherein the resistance

2   difference characteristic variable is determined only from those

3   voltage/current value pairs whose second current voltage/current value

4   pair at a second time was measured at the earliest 1 second after the

5   current change.

1   29.   The method of Claim 1 wherein the resistance

2   difference characteristic variable is determined only from those

3   voltage/current value pairs whose second current voltage/current value

4   pair at a second time was measured at the earliest 10 seconds after the

5   current change.

1   30.   The method of Claim 1 wherein the time intervals

2   between the at least two times is temperature-dependent, with the time

3   interval being greater for higher temperatures than for lower

4   temperatures.

1   31.   The method of Claim 1 wherein the resistance

2   difference characteristic variable is determined only from voltage/current

3   value pairs which are measured at two times and for which the second

4   voltage/current value pair was measured only when the time integral of

5   the current flowing, starting from the time of a current change after the

6   measurement of the first voltage/current value pair to the second time of

7   the measurement of the second voltage/current value pair has a value of

8   at least 0.01 mAs per ampere hour of storage capacity of the energy

9   storage battery.

1   32. The method of Claim 1 wherein the resistance

2   difference characteristic variable is determined only from voltage/current

3   value pairs which are measured at two times and for which the second

4   voltage/current value pair was measured only when the time integral of

5   the current flowing, starting from the time of a current change after the

6   measurement of the first voltage/current value pair to the second time of

7   the measurement of the second voltage/current value pair has a value of

8   at least 0.1 mAs per ampere hour of storage capacity of the energy

9   storage battery.

1   33. The method of Claim 1 wherein the resistance

2   difference characteristic variable is determined only from voltage/current

3   value pairs which are measured at two times and for which the second

4   voltage/current value pair was measured only when the time integral of

5   the current flowing, starting from the time of a current change after the

6   measurement of the first voltage/current value pair to the second time of

7   the measurement of the second voltage/current value pair has a value of

8   at least 1 mAs per ampere hour of storage capacity of the energy storage

9   battery.

1   34. The method of Claim 18 further comprising utilizing an

2   approximately standard current profile of the current pulses, with the

3   current profile being determined from current rates of change of the

4   current change between the voltage/current value pairs, the time period

5   between a first voltage/current value pair and the current change, and the

6   time period between the current change and the second voltage/current

7   value pair.

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1   35.   The method of Claim 1 wherein the current pulses are

2   applied to the energy storage battery by means of an electrical switching

3   unit.

1   36.   The method of Claim 1 further comprising comparing

2   at least one of the resistance difference characteristic variable and the

3   amount of charge which can be drawn with a threshold value.

1   37.   The method of Claim 36 further comprising outputting

2   at least one of the overshooting of the threshold value, the ratio of the

3   resistance difference characteristic variable or the amount of change

4   which can be drawn from the storage battery to the threshold value, and

5   the discrepancy between the resistance difference characteristic variable

6   or the amount of charge which can be drawn from the storage battery

7   and the threshold value.

1   38.   The method of Claim 36 wherein the threshold value is

2   defined as a function of temperature of the energy storage battery.

1   39.   The method of Claim 1 further comprising determining

2   at least one of the total present storage capacity of the energy storage

3   battery and the amount of charge with which the energy storage battery

4   can be charged by correlating the calculated amount of charge which can

5   be drawn from the storage battery with at least one of a present degree

6   of discharge and a present state of charge.

1   40.   The method of Claim 1 further comprising determining

2   a wear characteristic variable in order to describe reduction in storage

3   capacity of the energy storage battery by correlating the determined total

4   present storage capacity of the energy storage battery with the storage

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5   capacity of the energy storage battery when new, or with the nominal

6   value of the storage capacity of the energy storage battery when new.

1   41.   The method of Claim 40 further comprising comparing

2   the wear characteristic variable with a threshold value and outputting a

3   servicing message as a function of the comparison.

1   42.   The method of Claim 1 wherein the energy storage

2   battery is a lead-acid rechargeable battery.

1   43.   The method of Claim 1 further comprising linking the

2   resistance difference characteristic variable to a state variable for the

3   energy storage battery.

1   44.   The method of Claim 43 wherein the state variable is

2   selected from state of charge, power capability of the energy storage

3   battery, and characteristic variables for effects which contribute to wear

4   in an energy storage battery.

1   45.   The method of Claim 1 further comprising predicting

2   the behavior of the energy storage battery in an operating state other than

3   a present operating state.

1   46.   An energy storage battery having measurement means

2   and processor-controlled evaluation means configured to carry out a

3   method comprising the steps of:

4   measuring current values and voltage values at at least

5   two times in a voltage response of the energy storage battery to at least

6   one current pulse, with one voltage/current value pair being obtained for

7   each of the at least two times;

8   calculating a resistance difference characteristic

9   variable utilizing the measured voltage/current value pairs; and

10   determining of the amount of charge which can still be

11   drawn from the energy storage battery utilizing the resistance difference

12   characteristic variable.